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DOES SELECTIVE LOGGING OFFER A PRACTICAL SOLUTION OF BEETIE CONTROL IN PONDEROSA PINE STANDS

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Copy for information to Mr. Miller

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Introductory Statement

During the past two decades the western pine beetle has killed billions of board feet of ponderosa pine in California, Oregon, Washington, and Idaho. Government and private timber alike has suffered and is still suffering from epidemic activity of the pine beetle although the 1938 picture is much brighter than that of a few years ago. Protective agencies have cooperatively and independently carried on control work by the usual "cut, peel, and burn" methods with the technical advice of the federal Bureau of Entomology. Even though such control work has usually cost from 50¢ to $1.00 per acre and in some instances has had to be repeated, the results have ordinarily justified the cost. In other cases, efforts have been made to salvage the beetle infested and beetle abandoned trees but because blue stain so rapidly reduces the value of the sapwood, and because the infested and abandoned trees are so widely scattered over considerable areas, only in a few instances has such salvage been profitable. On other areas, both in private and government ownership, the western pine beetle became so thoroughly entrenched that rapid cutting of the endangered bodies of timber appeared to be the only sensible plan of action.

Need of Preventive Methods

Direct control work against impending epidemics and rapid liquidation of threatened timber are both remedial steps and as such they have many obvious disadvantages. The realization of this led the western stations of the Bureau of Entomology to analyze the possibilities of preventive measures in handling the western pine beetle problem; in other words, to determine what could be done to prevent the epidemics from starting. Progress on this problem has not been rapid because it involved a long-time analysis of the causes of epidemics and necessitated a study of the relative susceptibility of the various types of trees to pine beetle attacks. However, sufficient progress on these matters has now been made to justify the general statement that a certain type of selective logging can be of considerable assistance on at least the more accessible areas by limiting the first cut to those trees most likely to die and at the same time leaving a sizable proportion of the original stand for a later cutting in the form of trees fairly resistant to beetle attack.

Selective Logging as One Solution

What kind of selective logging is best suited for protection purposes and what basis is there for assuming that it will actually be effective as a protective measure? The answer to these two questions is the primary purpose of this paper.

We can best understand what type of selective logging in ponderosa pine fits our protection needs if we first analyze how

the trees in an average pine forest vary in maturity and in thrift. Broadly speaking, three maturity classes are to be found; namely, the immature, the mature, and the overmature classes. Because under present economic conditions the logging of immature timber is not profitable and because it usually makes up only a small proportion of the original stand, we will consider only the mature and overmature tree classes. The mature trees can be subdivided into three thrift groups; namely, trees of best thrift, trees of moderate thrift, and trees of poor thrift. The same subdivision into three thrift or vigor groups applies also to the overmature trees because overmaturity does not always mean poor thrift.

The Most Suitable Type of Selective Logging.

Now for the application of this maturity and thrift classification to the type of selective logging which we have in mind. Recent research by the Bureau of Entomology in Oregon indicates that in a pine forest in which the beetle infestation is not aggressively epidemic, the mature and overmature trees may be divided into three hazard ratings based on their maturity and thrift.

1. Highest hazard. Here are included the poor thrift, overmature trees and also the poor thrift, mature trees.

2. Moderate hazard. This hazard rating includes first the moderate thrift overmature trees and then, somewhat lower in hazard rating, the thrifty mature trees.

3. Lowest hazard. These are the best thrift overmature trees and the best thrift mature trees and they constitute only a relatively small part of the virgin stand.

If the main purpose of the first cut is to remove only the highest hazard trees then the cut could well be confined to the mature and overmature trees of poor thrift. Stands of ponderosa pine vary but often this highest hazard volume is only about 25% of the original stand. The concentration of the first cut to the highest hazard timber has the decided advantage of hastening the completion of the first logging of the area, thereby decreasing the losses in the timber to be cut as well as more quickly reducing the beetle hazard in the trees to be left in the reserve stand. It is likely that the salvage and protection advantages of such a light cut must be sacrificed somewhat in order to provide a sufficiently large volume per acre to meet the costs of transportation facilities and logging. If this is the case, part of the moderate hazard timber should next be considered for removal in the first cut. The moderate hazard timber, as has already been stated, includes both the good thrift overmature trees and the good thrift mature trees. However, the overmature trees of good thrift are more susceptible to losses than mature trees of similar thrift. For this reason an increase in the severity of the cut should first include this overmature timber. This addition to the cut will ordinarily result in the removal of from 40% to 50% of the original stand. It is this type of cutting that is in progress on several National Forests in Oregon. However, high hazard mature and overmature trees of the smaller diameters are not marked for cutting if they are regarded to be unmerchantable. Most of the best thrift overmature trees are marked but these make up a very small part of an average ponderosa pine stand.

Let us see now what the reserve stand consists of under this 40% to 50% cut. In the first place, only the unmerchantable portion of the high hazard timber remains in the reserve stand. As a consequence, this reserve consists primarily of the immature timber and the mature timber of both best and moderate thrift. Should a cut of 40% to 50% still be insufficiently heavy to serve the economic requirements of the operation, the next timber which should be considered for cutting from the hazard point of view is that portion of the mature timber of moderate thrift which is in the larger diameters on the assumption that these larger mature trees more nearly approach overmaturity than smaller mature trees.

In addition to being classified into maturity and thrift classes, trees in ponderosa pine forests may be classified according to their value from the operator's point of view. In deciding upon desirable selective logging practice, it may be necessary to bring value and timber quality considerations into the picture. However, the extent to which high hazard timber is left in the reserve stand and timber of the lower hazard ratings is cut, will obviously determine the effectiveness of the cut from the salvage and protection standpoint. Adherence to a value marking policy will usually result in the removal of a part of the high hazard timber, but it will of necessity involve also the cutting of a considerable part of the thrifty mature timber, even that part of it in the smaller diameters. Undoubtedly a sensible procedure will usually be found in a compromise between the thrift maturity marking and quality marking.

Recognition of Tree Classes Involved in Selective Logging.

How are the various maturity and thrift classes of trees to be recognized? A tree classification has been developed by Mr. F. P. Keen, of the Bureau of Entomology, as a result of long-time studies in western pine beetle infestations in Oregon and northeastern California. This classification was built up for the specific purpose of dividing the trees in virgin ponderosa pine forests according to their hazard rating. In his efforts to accomplish this, he found it desirable to have four classes of maturity, known as 1, 2, 3, and 4. These four classes are also designated by the terms young, immature, mature, and overmature. Each maturity class was divided into four thrift groups known as A, B, C, and D. A represents the best thrift, B the moderate thrift, C and D the poor thrift. This makes a total of sixteen tree classes. Since the immature timber, represented by classes 1 and 2, is usually not cut in any selective logging method, our interest is primarily centered in classes 3 and 4, the mature and overmature trees. In this paper, C and D trees have been thrown together and called the poor thrift trees, B the moderate thrift trees, and A the best thrift trees. For both the maturity and thrift classes, specific descriptions and definitions have been prepared by Mr. Keen. My own experience in teaching this classification, even to men without previous experience in ponderosa pine, has been most gratifying. The rapidity with which new men can learn to distinguish these tree classes in the woods and then apply

them to the marking rules is surprising. Complete agreement between even two experienced men in this tree classification work is not possible, but the same classification for 80% to 90% of the trees is not unusual.

Effectiveness of Selective Logging as a Protection Measure

What assurance is there that the removal of the poor-thrift mature and overmature trees will safeguard the reserve stand from epidemic infestations until the time of the second cut, provided that this second cut is not delayed beyond a maximum of thirty years? The hazard ratings of the various tree classes are based on annual cruises of losses which have taken place for more than fifteen years in virgin stands on selected half sections and full sections primarily located in southern Oregon. During the past three years, 320-acre sample plots, totaling approximately 60,000 acres and scattered throughout the ponderosa pine stands of eastern Oregon and eastern Washington, have been cruised annually to determine what types of trees have died and to what extent trees of various hazard ratings occur in the living timber. This information, recently collected on a large acreage, representing data from such a wide variety of timber stands and growing conditions, corroborates the findings secured earlier by the Bureau on its southern Oregon plots.

Inasmuch as the reserve stands which result from the type of selective logging described in this paper have been available for

study for less than three years, there has been little opportunity to adequately compare the progress of losses on selectively logged areas and virgin timber. However, certain conclusions regarding the probable losses in the selectively logged areas seem justified. The average ponderosa pine stand has from 15 to 20 trees per acre which are 12 inches and over in diameter. Selective logging which removes 40% to 50% of the original volume involves the cutting of not more than five or six trees per acre, or about one-third of the total number. It is not believed that the cutting of such a small proportion of the trees materially changes growing conditions or results in any such increase in growth rate of the reserve trees, as sometimes followed the 80% cutting method formerly in use on the National Forests of Oregon and Washington. As a consequence, mature and overmature trees of poor thrift when left in the reserve stand are not likely to materially increase in thrift. This, in brief, is the basis for assuming for the present that it is likely that the mature and overmature trees which are high hazard trees in the virgin timber are likely to continue to be high hazard trees if left in the reserve stand.

A common characteristic of epidemic infestations of the western pine beetle is that groups of trees rather than scattered single trees are killed. Sometimes every tree on several acres is successfully attacked at one time during such an epidemic. This means that during epidemic periods the beetle population is so large and so aggressive that trees of all maturity classes and of all thrift classes are

killed with equal ease. On the other hand, when the infestation is in a quiescent or normal status, the losses are of much lighter severity and those trees which are in poor thrift and are overmature are preferred. By removing most of the bug fodder in a relatively light cut, it is thought that the beetles will not be able to maintain themselves in the better thrift timber in sufficiently large numbers during normal periods to take full advantage of climatic and other conditions favorable for their increase to an epidemic status. It is believed, therefore, that selective logging largely based on maturity and thrift will not only result in the salvaging of a larger proportion of the trees most likely to die, but possibly render less likely the occurrence of destructive beetle epidemics which kill all classes of trees.

Epidemic Losses on Cut-Over Areas

Epidemic infestations on a large and destructive scale often follow windfalls. Even fires are sometimes directly responsible for epidemic outbreaks. Without question, long drought periods so seriously reduce tree thrift as to enable small beetle populations to increase to tremendous numbers. Windfalls, fires and droughts have resulted in pine beetle epidemics even on cut-over areas in which as much as 80% of the original stand has been removed. In other cases, cut-over areas, because of their proximity to epidemic infestations in virgin timber stands, have suffered from beetle losses. Therefore, even the best type of selective logging cannot be expected to give complete immunity to heavy beetle losses. Epidemic infestations, whether in

virgin forests or on cut-over areas, will still require the use of direct control methods just as fires need to be fought when preventive measures fail. It is reasonable to assume, however, that on selectively cut areas, normal infestations will proceed on a lower scale and epidemics will be less frequent than in virgin stands of timber.

Present Status of Research on Selective Logging as a Protective Measure

In California a considerable amount of work has also been done by the Berkeley Station of the Bureau of Entomology to determine the hazard ratings of all types of ponderosa pine trees. The California station has found that for the Sierra region it may prove possible to recognize the high hazard trees on the basis of certain special characteristics which are closely related to thrift, but which are not fully taken into account in the Keen tree classification and in Keen's hazard ratings. On the Black's Mountain Experimental Forest in California, the removal of the highest hazard trees has already been started to provide a basis for determining the accuracy with which such ponderosa pine trees can be detected, as well as to make possible a test of the protection, silvicultural and economic aspects of a light cut of this character. This first cut includes only 25% of the original stand. Out of the research work in progress in California and that which is underway in Oregon and Washington, the Bureau of Entomology and the cooperating private and government agencies will undoubtedly be able to make still further progress in the development of selective logging methods best designed to reduce the ever present danger of pine beetle losses in ponderosa pine.